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The hidden moderator – Exploring the roles of tuo'er in intra-firm R&D online communities

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Abstract

“Tuo'er” in a market place are those who are hired by a seller and attempt to push the sales by exaggerating the advantages of a product in a direct and persistent approach. More recently, it is to our observation that some large firms start deploying tuo'er on their intranet to facilitate knowledge sharing and innovation within intra-firm online R&D communities. Just like those in a market place, tuo'er in online knowledge sharing communities also have a mandate to mislead other regular community members by creating a bandwagon effect. However, their intention to facilitate online knowledge sharing and innovation within a firm might serve a good purpose and their practice stands in a gray area of management ethics. This study explores the special roles of tuo'er as a hidden moderator between a company and its employees, investigates under which conditions they work, and the implications for the effective use of online knowledge sharing communities by firms. An in-depth case study with multiple data sources is conducted in China in a longitudinal fashion.

Introduction

When travelling in Cairo or Shanghai, tourists often will notice a very popular street vendor, selling souvenirs at an old fashioned local market where a number of customers show their enthusiasm in negotiating the price with the vendor and meanwhile appreciating the superior quality and incredible price advantage that one might never find elsewhere. Indeed, these “customers” are very likely not genuine: they are friends, families or hired guns by the vendor to create a scene of popularity to enhance sales. Often the items sold by the vendor might be of either inferior quality or absolutely fraud products. In Chinese, these special “customers” hired by the vendor to mislead potential customers to a buying decision has a special title, *tuo'er*¹ (direct translation is “supporters”). Tuo'er are not the same as touts, who attempt to

¹ In Chinese the singular and plural forms of a noun has the same pronunciation. Thus, in this paper, we use the term “tuo'er” for both singular and plural forms of this concept without adding an “s” at the end of the word.

sell something by exaggerating the advantages in a direct and persistent approach. In contrast, tuo'er do not directly push for sales.

Indeed, tuo'er have been widely used on the Internet: ghost bidders (ghost customers) are often used on online stores and become popular in online gaming communities as well. On online stores, tuo'er as ghost customers can create a bandwagon effect (Leibenstein 1950), a phenomenon in consumer psychology where increasing demand creates more demand (van Herpen et al., 2009). In online gaming communities, tuo'er are purposefully and strategically used in many large online games to lure ordinary users in and seduce them to spend more and more money on purchasing virtual weapons and armors for the main game characters in order to survive and proceed in a game (source: www.gamesky.com). Tuo'er in online stores and gaming communities are of no difference with those on local market in Cairo and Shanghai: they form alliance with the seller to push for irrational purchase.

More recently, it is to our observation that some large firms start deploying tuo'er on their intranet within intra-firm online R&D communities to facilitate knowledge sharing and innovation. These corporate tuo'er are not necessarily the same as ghost bidder on online stores and gaming communities for a number of reasons: (1) they do not have intention to trap other regular online community members to make a buy decision which would not be rationally made otherwise; (2) even though the practice of tuo'er is a *deception of goodwill* (Aditya 2001), but the intention to facilitate online knowledge sharing and innovation within a firm might serve a good purpose. Therefore, due to the special status and functions of tuo'er in firms' online R&D communities on their intranet, it is intuitively interesting to know how they play their roles, whether their roles are effective, and how they are motivated to as tuo'er. The answers to these questions are important for managers to understand whether and how to use tuo'er to enhance intra-organizational knowledge sharing and foster innovations.

The extant literature on online communities is rich, but typically suggests a rational choice perspective (Grandori 1997), which put a premium on (1) understanding the attributes of users (Jeppesen and Fredriksen 2006), (2) aligning the motivations of participation and contribution (Shah 2006), and (3) deploying formal and informal governance mechanisms within online communities (Li-Ying and Salomo 2013). The underlying logic implies that when users with appropriate attributes in online communities are motivated according to their attributes and corresponding governance is deployed, knowledge sharing and innovation will somehow take place (Cook 2008). This logic is synonymous to the rational model of market, where irrational behaviors are regarded as noises and thus discarded. However, tuo'er in intra-firm online communities might just be responsible for creating "noises", which affect other community members to conduct unintended behaviors. The current literature has not yet counted for this kind of irrationality, which could be caused by the roles of tuo'er.

The literature on sociology, communication (Sundar and Nass 2001; Sundar et al. 2008) and consumer psychology (Leibenstein 1950, van Herpen et al. 2009) are insightful, especially about the bandwagon effect, but not directly applicable to firm-hosted online communities, which is a special form of organization where hierarchical authority co-exists with a distributed platform structure. Meanwhile, theories in organizational culture (e.g., Martin 2002; Thompson et al. 1990; Jackson 2011) and management ethics (e.g., Jackson 2000; Jackson 2001; Sandin 2009) seem to have a new encounter with the phenomenon of tuo'er as well. Therefore, the roles of tuo'er in intra-firm or firm-hosted online communities need to be addressed and the theoretical foundation for such a phenomenon needs to be explored.

Therefore, this study aims at enriching the theoretical foundation for online communities by highlighting the special roles of tuo'er in intra-firm R&D online communities. Using multiple data sources of a case company and a combination of longitudinal and cross-sectional research design, we explore the perceived roles of tuo'er and test some hypotheses

with regard to the relationships among tuo'er's roles, their actual online contributions and received attentions, their intrinsic and extrinsic motivations, and their potential exhibition of lead user traits. By all means, we contribute to the literature on intrafirm online knowledge community design and knowledge sharing on virtual platform in general. Companies that have already or are going to deploy tuo'er in their intranet shall take notes about how tuo'er can be used effectively without risking into unethical management practice.

Theoretical background

As the phenomenon of tuo'er is rather unique, several streams of theories in the literature become relevant. We hereby not only briefly review these important theoretical backgrounds, but also point out why each of these existing theories alone is not necessarily sufficient to explain the tuo'er phenomenon on intra-firm online communities.

Bandwagon effect and marketing deception

Tuo'er on a marketplace and in online communities have one thing in common: their presence is not based on their genuine interests of participation and they have a mandate to mislead other regular customers/users by creating a bandwagon effect. Early studies in economics on demand theory and theories in consumer psychology have long noticed the non-additivity in consumer demand. As a non-functional demand in economics, bandwagon effect refers to the extent to which the demand for a commodity is increased due to the fact that other people are buying the same commodity (Leibenstein 1950). Behind the economical interpretation, there is also a salient consumer psychological explanation for bandwagon effect that links to herd behavior (Banerjee 1992; Bikhchandani et al. 1998; Corneo and Jeanne 1997) and psychological theories of conformity and social influence (Asch 1955; Baron et al. 1996).

Bandwagon effects occur when consumers follow the behavior of others. Consumers may do this because they want to get into "the swim of things", to conform with the people they wish to associate with (Berger and Heath 2007; Escalas and Bettman 2005), or because they believe that the choice behavior of others reveals the product's uniqueness (van Herpen et al. 2009) or superior quality (Kardes et al. 2004; Huang and Chen 2006), which they cannot afford missing out. The behavior of others thus provides additional clues to create a mental shortcut used as a judgment rule for making quick evaluations. This is the so-called *bandwagon heuristic* (Sundar 2007). In other cases, the presence and observable act of an expert might trigger *expertise heuristic*, which leads to directly positively evaluations of the statement without scrutiny of its content.

With the emergence of tuo'er on the intranet of knowledge sharing portal within large firms, can classic economics theory in consumer demand and theories in consumer psychology sufficiently count for the seemingly controversial deployment of tuo'er? Our answer to this is probably "no", because, first, the roles of tuo'er in on an intra-firm online community for knowledge sharing might be different from traditional tuo'er on marketplaces, even though a bandwagon effect can be created; second, whether and to what extent expert heuristic can be created and effective is also questionable; last but perhaps the most important reason is that these theories are based on calculative rationality and ethical assumptions (Leibenstein 1950; van Herpen et al. 2009), which completely ignore deception.

Marketing deception has been researched mainly in two domains: (1) cases that involve the intentional deception of people who have compromised intelligence, such as children or the elderly, and (2) cases that involve intentional falsehoods or the withholding of vital information (Wible 2011, pp. 17). Most of the theoretical and empirical studies on deception in marketing involve advertising, while relatively less attention has been paid to deception in other marketing practices (Aditya 2001). According to Webster's Encyclopedic Unabridged Dictionary (1996), to deceive is "to mislead by a false appearance or statement"

(p. 516). Based on a comprehensive review of researches on marketing deception, Aditya (2001, pp.743) defines deception in marketing “*as being any act, claim, or message that (a) causes at least some consumers acting reasonably to make decisions that they would not otherwise make; (b) leads at least some consumers acting reasonably to believe something about the product, brand, or manufacturer that is not verifiably true; or (c) has the potential to foster distrust of any kind, general or specific, or in other ways cause an erosion of ethical values deemed desirable in society.*” According to this definition, those activities of tuo’er on the marketplaces in Cairo and Shanghai are most likely of deceptive practices. Interestingly, Aditya’s (2001) work does not mention the direct use of tuo’er at all, reflecting the fact that tuo’er is perhaps a concept and practice that is alien to the Western rationality and culture.

The question is: can tuo’er in intrafirm online communities for knowledge sharing be seen as deception? Tuo’er do not target at people with compromised intelligence and they don’t have to lie or withhold vital information. However, their acts do cause other regular online community members to make decisions (in terms of uploading documents, sharing experiences, posting messages, and participate in collaborative innovation) that they would not otherwise make and at least to some extent their impression of the honesty and genuine interests of learning within the community is not verifiably true. Eventually concerns about distrust within an online community could arise if a firm’s use of tuo’er is discovered. Thus, tuo’er perhaps stands at a “gray area” of deception.

Motivations to contribute in online communities

There is a rich body of literature on why people participate and contribute on online communities to share information, collaborating and co-create. First, many case studies have demonstrated that people are motivated to join online knowledge sharing (hereinafter “KS”) communities for very different reasons (Shah 2006; von Hippel and von Krogh 2003; Dahlander and Magnusson 2005; Dutton 2008; Namibisan 2002; Namibisan and Baron 2007; West and O’Mahony 2008). While some find contributing to a particular community intrinsically interesting, others are extrinsically motivated to seek solutions to their specific needs (Shah 2006; Jeppesen and Frederiksen 2006).

A firm normally needs to foster community interactions to retain intrinsically motivated users, create incentives for extrinsically motivated users, and show strong commitment from top management. To our best knowledge, research on motivation issue in online communities has never considered tuo’er to date because rational choice and ethical behavior are the taken-for-granted assumptions, leaving no room for investigations in “gray areas” of management practice. In fact, it is possible for tuo’er to play different roles to motivate online community members. First, for intrinsically motivated users, it is important to provide process-oriented incentives. For instance, a tuo’er can ‘promote’ challenging development tasks to hobbyists or challenge seekers makes them intrinsically interested and satisfied (Dahlander and Magnusson 2005). Also, tuo’er are asked to ensure frequent and timely feedback in the communities to create a feeling of belonging that hobbyists appreciate (Namibisan 2002; Namibisan and Baron 2007; Dahlander and Magnusson 2008). Second, for extrinsically motivated (need-driven) users, outcome-oriented incentives are perhaps more effective. For instance, fringe benefits (candy reward) are used to motivate users to submit creative designs to a community (Dahlander and Magnusson 2005), where tuo’er may be used to be the first to react on or inflate the magnitude of reactions to such calls, making a great deal out of it. Third, even top management’s commitment to supporting intrafirm KS online communities can be realized if some of the top management of a firm themselves are tuo’er. In short, as providing appropriate incentives for altering or manipulating one’s motivations and behavior is a key function of control (Sundaramurthy and Lewis 2003; Walsh and Seward

1990), firms has reasonable incentives to use tuo'er to attract the right persons to participate and contribute, and retain the employees in intrafirm online KS communities.

However, research in this respect is void in two aspects: first, we know little about how the roles of tuo'er are effectively played to align online community members' motivations; second, little insights are available about how tuo'er *themselves* are motivated to participate and contribute to intrafirm KS communities.

Organizational culture

Firms using tuo'er to intentionally influence employees in intrafirm online KS communities have a clear purpose: to transform a firm's organizational learning culture from hierarchy to distributed ones. This is where theories of organizational culture become relevant to tuo'er as well. As the literature on organizational culture is extremely rich, we selectively review the three-perspective of organizational culture (Martin 2002) and the group and grid culture theory (Thompson et al. 1990; Jackson 2011) to understand the rationale of using tuo'er in intrafirm online KS communities and the potential conflicts they might create.

Martin (2002) suggests that culture within an organization is constantly struggling among three statuses: integration, differentiation, fragmentation. *Integration* refers to a status when values within an organization are well integrated and aligned and there is consensus among all organization members, who have mutually consistent interpretations of organizational culture. *Differentiation* refers to a status that consensus of values and culture exists but only at lower levels of operations within an organization, allowing for coexistence of multiple subcultures. *Fragmentation* refers to a status where culture ambiguity is normal, salient and inescapable for an organization. Fragmentation often happens within young firms without a strong leadership and within firms in transition turmoil. The grid and group culture theory conceptualizes organizational culture along two dimensions: *grid* (the extent of hierarchy) and *group* (the degree an employee is associated with and sustained by group membership) (Thompson et al. 1990; Jackson 2011). Four types of organizational culture appear based on the grid and group framework: (1) *hierarchism* represents a culture where employees are strongly associated with their groups in a hierarchical organization structure; (2) *fatalism* represents a culture where employees are weakly associated with their groups in a hierarchical organization structure; (3) *individualism* represents a highly distributed and autonomous culture where low levels of hierarchy and association with groups is predominant; and (4) *egalitarianism* refers to a culture form where employees are strongly associated with the group of their own choice without being constrained by a strong level of hierarchy.

Given a firm's hierarchical structure, it can be interpreted that the decision made by the management of a firm to implement intrafirm online communities to foster knowledge sharing and innovation is based on a rationale of transforming the organizational culture from hierarchism and/or fatalism to egalitarianism. As mentioned before, a firm may use various means to achieve such a transition of organizational culture without creating "differentiation" and "fragmentation". However, transparency and honesty of management are questionable when approaches such as the use of tuo'er are used to change organizational culture and research in this respect is relatively underdeveloped.

Transparency and management ethics

Transparency serves as a governance mechanism for corporate management because it not only helps monitor information exchange relationships, but also makes coordination of multiple tasks in online communities much easier. Increasing transparency may facilitate the formation of norms, which in turn reduces the cost of monitoring (Li-Ying and Salomo 2013). Three aspects of transparency in online communities have been discussed in the literature: content information transparency, role transparency and process transparency. First, intrafirm online KS communities need to ensure contention information transparency so that

information seekers and providers carry out knowledge exchange on a search-friendly, traceable and reliable platform (West and O'Mahony 2008). Second, role transparency ensures the right persons with the right function and competence can enter a right kind of exchange relationship in a community (Namibisan 2002). Third, process transparency makes information exchange relationships and the following development (if any) process clear and explicit (Namibisan 2002; West and O'Mahony 2008). The problem of tuo'er's actions in intrafirm online KS communities is that role transparency is distorted and process transparency might also be compromised.

Furthermore, the broad stream of literature on management transparency basically can be divided into two main perspectives: the static perspective associates transparency with information disclosure related to a firm's business activities through standardized documents, upon stakeholders' requests or regulatory requirements, including social, sustainability and financial reports (e.g., Henriques 2001; Kaptein 2004; Quaak et al. 2007), while the dynamic perspective views transparency as an IT-driven communication process, in which firms and stakeholders interact to share information and cooperate (Santana and Wood 2009; Turilli and Floridi 2009). It is in this dynamic perspective, intrafirm online KS platforms are introduced by many large firms because they want knowledge distributed among employees within the organization can be shared in a transparent way without being constrained by hierarchical organizational structure, creating an effective and efficient transactive memory system (Brandon and Hollingshead, 2004). However, the fact that tuo'er on intrafirm online KS communities are hidden from regular community members makes it a dishonest behavior and compromises management transparency (Sandin 2009).

Some empirical studies have suggested that an ethical culture is needed for successful adoption of information systems (Rupple and Harrington 2001) and ethical leadership is important as well because it influence the followers' decision making (Steinbauer et al. 2014). At the first glance, the deployment of tuo'er is far from the virtue of truthfulness, a higher level of management transparency (das Neves and Vaccaro 2013). To judge the ethical quality of actions, it is necessary to consider the threefold criterion used by Thomas Aquinas, i.e., the object (*finis operis*), the intention (*finis operantis*), and the circumstance (*debitis circumstantiis*), which reflected in the case of tuo'er in intrafirm online KS communities is that the intention of top management is to ensure a smooth transition of organization culture without creating fragmentation and enhance knowledge sharing within organization, instead of using tuo'er to police the interactions among community members; meanwhile there is a strong consensus within the organization that knowledge sharing could possibly be enhanced by distributed IT means. In this sense, the top management's decision with regard to using tuo'er might not seem so guilty. In line with this argument, some researchers have noticed that there are not only *ethics of justice* but also *ethics of care* (Sandin 2009; Simola 2003; 2005): tuo'er might not be regarded ethical in justice, but they can be used to strengthen ethics of care for the sake of fostering better organizational culture and enhance knowledge sharing, by timely responding to other people's post of new ideas and threads, maintaining the active atmosphere within a community, and continuously motivating participants' contribution. Therefore, the behaviors of responsible managers and tuo'er are loyal to the organization, an important aspect in management ethics (Jackson 2001; Jackson 2000). However, the tricky part in such a case is that once the systematic use of tuo'er defects (i.e., tuo'er are figured out by some regular online community members), it may completely backfire and the entire top management may hold responsible for taking advantage of employees' trust and manipulating their knowledge contribution. Based on the discussions above, we recognize tuo'er stands in a "gray area" in corporate ethical discussion. We know little about these gray areas in general and even less about tuo'er in particular.

Overall, the discussions above pinpoint that the use of tuo'er in intrafirm online KS communities is a new form of organizational communication, which has implications on users' motivational psychology, organizational culture, and management ethics. Existing theories in economics, marketing, organizational culture, and management ethics do not sufficiently count for this new phenomenon. Therefore, a fundamental understanding about the roles of tuo'er and how effectively they work is needed, using an in-depth case study (Yin 1993).

Intrafirm online R&D communities within a large Chinese corporate

The empirical context is within a Chinese multinational heavy machinery manufacturing company (for confidentiality reasons, it will be referred hereinafter as "the company"), headquartered in Hunan Province. It is one of the largest heavy equipment manufacturers in the world, listed on the FT Global 500 and the Forbes Global 2000. The company is organized into a number of major divisions and subsidiaries, including a concrete pump division, a road construction division, a port machinery division, a mobile crane division, an electric Co., Ltd., two heavy machinery subsidiaries, a heavy equipment subsidiary, and a Science and Technology subsidiary. The company has four international R&D and manufacturing facilities in India, the USA, Germany, and Brazil, respectively. The company puts a premium on R&D excellence and pursues global leadership in product innovation in its industry. On average, 5%-7% of the group's annual revenue is used for R&D investment. By the end of 2014, the company has made 8,282 Chinese patent applications and 405 international patent applications.

The company has approximately 90,000 employees worldwide, among which 4,000 R&D personnel are located in China at about 70 R&D institutes within the corporate. The intrafirm online R&D platform was established in June 2012 and has been operating up to now. It was designed and introduced with a purpose to enhance knowledge sharing and innovation among R&D personnel. In principle, all the R&D personnel of the company in China have access to the online platform as regular users and several online forums have been formed around topic areas, such as hydraulic engineering, mechanical engineering, electrical engineering, material engineering, specific crafts, technology benchmarking, simulation, etc. These forums form virtual knowledge communities, which can be roughly divided into six main categories, i.e., *technological exchanges*, *R&D management*, *application of tools*, *product development*, *knowledge management*, and *administrative topics*. During the observation period (March-July 2014) of this study, more than 50% of the R&D personnel on average visited the online platform on a monthly base. Discussion topics in different forums received different levels of attention, ranging from more than 300 times to less than 5 times of visits and costing from more than 3 hours to less one minute of viewing time.

Since its establishment, the intrafirm online R&D platform has received more and more attention from the top management and R&D personnel within the company. This has been demonstrated by the fact that, on the one hand, the management of all research institutes have recognized its relevance for the company's strategy and development of employee competence and participated in discussions within the online forums; on the other hand, the monthly average number of visits and viewing time have been consistently increasing. However, according to the manager of the intrafirm online R&D platform, it has not yet reached its full effectiveness because extensive discussions and exchange of knowledge have been relatively concentrated within a dozen of R&D institutes and a few hundreds of active R&D personnel as the key online community users. Therefore, the idea of how to systematically use tuo'er among these forums (communities) to boost knowledge sharing caught the management's attention.

To better understand how tuo'er play their roles in online R&D communities of the company, we had some interviews with a number of key persons, who are highly representative of different perspectives. The interviewees included the chief manager of the intrafirm online communities, two official tuo'er, and a regular community member. All of them are employees of the company and registered users of the online R&D platform. An overview of the interviewees and the reason why we believe their opinions are reliable sources of information and representative of different perspectives of users and the company is provided below in Table 1.

Insert Table 1 here

First, the online R&D platform manager is responsible for knowledge management of the entire company and has been keen on using the form of online community to foster knowledge sharing among R&D staff. He was also one of the founders of the online R&D platform and knowledgeable in various aspects of online community design. The idea of using tuo'er, according to him, was one of the original plans of implementation to ensure a sufficient level of online interactions on discussion forums and knowledge sharing. Second, the two interviewed tuo'er both felt that they have been making positive contribution to the online communities by creating a more friendly and active atmosphere for regular members to participate and share knowledge online. Thus, it is a common understanding among tuo'er that they are doing a favor for the company and members of the online R&D communities without committing illegal and unethical behaviors. Third, we also interviewed a regular member of the online R&D platform. He has been an active member of the online communities since the platform's establishment. He fully understood the logic of tuo'er and to a great extent believed that if tuo'er is used in a right way, it may well serve a good purpose for the company.

All interviewees were at first asked whether they were aware of the concept of tuo'er and how it usually works in other context. Surprisingly, the answers were unanimously positive and they all knew that tuo'er has been used extensively in the online gaming industry where a group of professional gamers, referred to as "the studio", in an online game act behind the scenes by manipulating a regular gamer's desire to update his character's equipment while remain motivated to play through the game. Interviewees admitted that at the beginning the online R&D platform did not receive sufficient attention from R&D personnel and it became necessary to have someone regularly stimulate the knowledge sharing atmosphere on the online R&D platform and create a community feeling. As it is a complex mechanism of using tuo'er to manipulate online users' motivations, all interviewees agreed that it is worthwhile to learn from "the studio" in the online gaming industry and make a good use of tuo'er on the online R&D platform of the company.

When asked about how tuo'er functions or should function on the online R&D platform, the interviewees provided interesting insights about the roles of tuo'er, summarized as following:

- (1) *to stimulate interactions among community members.* Tuo'er sometimes help each other to promote a topic discussion across different online forums. When noticing the discussion around an interesting topic is fading away too quickly before substantial knowledge gain has been achieved, a tuo'er usually can act on it by contributing with an insightful comment or providing complementary information sources to bring the discussion "alive" again. Compared to other institutionalized superficial rules, for instance, that oblige each employee to share a file and post a thread each month, the use of tuo'er is much more effective in stimulating knowledge sharing, because the former approach ruins people's intrinsic motivations. A tuo'er should be able to either

help answer a specific question of knowledge inquiry or post an interesting and insightful thread with original content.

- (2) *to influence direction of discussion.* Tuo'er often help label and categorize the documents shared by regular community members, so that a discussion can be led towards a direction that is under the control of tuo'er. When noticing a sensitive topic is getting overly heated, a number of tuo'er act collectively by adding new posts to suppress the topic down to the bottom of a page so that fewer people will notice it. This approach is referred to as "level building" in Chinese. A relatively information-rich and technically sophisticated post is more likely to get people's attention and following-up reaction.
- (3) *to influence decision making.* A tuo'er can become a positive role model by showcasing knowledge sharing behavior that solves a concrete (technical or management) issue of the company. This can be done, for instance, by providing critical information to a solution-seeking post made by senior management and directly influencing the decision making of management within the company.

We also learned from the interviews that a typical tuo'er has a number of characteristics:

- (1) *Identities:* There is no hierarchy among tuo'er on the online communities because they use alias as their usernames and their real identities are not always known. A tuo'er usually is aware of the existence of other tuo'er. A tuo'er may be active in multiple discussion forums under different topic categories and may also have multiple usernames, appearing with multiple identities without being noticed as the same person.
- (2) *Contribution and attention:* Tuo'er recognize that it is an art to find a balance between overdoing (resulting in overly heated online interaction and too powerful individual status) and underdoing (resulting in ineffective user interactions in online communities). A tuo'er needs to be to some extent knowledgeable in the topics that he/she is about to intervene. When a tuo'er continues contributing as such, he/she is more likely to be perceived as an expert, who gradually becomes more and more influential in the online community.
- (3) *Motivations:* On the one hand, tuo'er constantly monitor and participate in the discussions on the online forums of his/her interests. It is commonly recognized among the interviewees that when tuo'er help stimulate knowledge sharing among R&D staff, it seems a personal loss for the knowledge holders in a short run, but it will eventually become a gain for the entire R&D function of the company in a long run. On the other hand, as the key performance indicators of knowledge sharing for each R&D institute within the company are summarized, evaluated, and reported by the manager of the online R&D platform to the top management, tuo'er at each institute to varying extents have a motivation to keep contributing to the online R&D communities. There is also a monthly monetary award, granted at the corporate level, for the best contributing community members. Thus, tuo'er could be both intrinsically and extrinsically motivated to contribute to the online community.

Based on theoretical review and these interviews, we are informed and have good reasons to expect that intra-firm R&D online communities may effectively use tuo'er to foster knowledge exchange among online community users (employees). These highly interesting insights mentioned above provide us with the preliminary inputs, which will be used as the foundation to further develop several testable hypotheses with regard to the relationships among the roles of tuo'er and their *contributions, received attentions, motivations, and lead user (expert) traits.*

Hypotheses development

The roles of tuo'er revisited

The interviews informed us that tuo'er may play different roles in intrafirm online R&D communities, namely, *stimulating interactions* among community members, *influencing direction of discussion*, and *influencing decision making*. These roles can be understood through the lens of some existing theories. First, like any regular members in an online community, a tuo'er's opinion expressed through original posts or reactive comments to others posts will be seen by all other community members. This may signal a number of messages to other members: (1) it is absolutely fine to express your opinion openly in a group of likeminded persons (confirming an open organizational culture; Jackson, 2011); (2) there are people who care about the issue that one may or may not disagree (confirming motivations of contribution; Shah 2006) within the company; (3) there are opportunities for others in the community to correct or complement the posted information (confirming opportunities for organizational learning; Woodman et al. 1993); and (4) when information is shared by one, reciprocal behavior is expected from other community members (Ekeh 1974). As a consequence, knowledge exchange is more likely when someone makes an initiative to offer (Li-Ying and Salomo 2013). In turn, the behavior of tuo'er becomes additional clues for other community members to create a mental shortcut used as a judgment rule for making quick evaluations. As long as a number of other online community members (including other tuo'er) react to a tuo'er's posts, a *bandwagon heuristic* will possibly emerge (Sundar 2007). Second, tuo'er can also influence the direction of discussion by keeping a post or an inquiry of knowledge "alive" for a while or "bury" it by "level building". When several tuo'er are working on a line of interactions with regard to a specific discussion, they may take advantages of a bandwagon heuristic. Moreover, if one of the tuo'er based on his/her previous deeds and knowledgeable reputation on an online platform makes an explicit feedback, an *expert heuristic* can be utilized as well. In this case, a discussion can easily be directed towards one that seems like what the majority agrees and what the expert confirms. Third, the combined use of bandwagon heuristic and expert heuristic can also be used to directly influence the decision making of the management if members of the top management are on the online communities as regular members, who seek solutions to their management problems. In such a case, a tuo'er basically has two options: either to make an effort to research about the solutions and provide it to the solution seeker, when there is no one reacting, or to offer an alternative (and more seemingly convincing) solution, when someone has already provided a solution. Either way, a tuo'er may make him/herself a role model in the communities and within the company, making him an "expert" in the communities in the future.

Are tuo'er's roles effective?

The three major roles of tuo'er need become effective through actions, which lead to visible results. On the one hand, a tuo'er needs to constantly monitor the development of opinions and information dissemination on the online community. Concrete actions need to be taken by actively posting original discuss topics, responding to other community members' posts, posting knowledge sources, uploading useful documents. In other words, a "silent" tuo'er will never effectively play his/her roles on the online R&D community. When a particular tuo'er is actively taking these actions, he/she may create an expert heuristic; when a number of tuo'er are taking these actions in a collective and coordinated way, it will be possible to create a bandwagon heuristic. Therefore, we expect that the more contributions a tuo'er makes (in quantity) to an intrafirm R&D online community, the more evident his/her roles of tuo'er are effectively played. We hypothesize:

H1a: The contribution of a tuo'er to an intra-firm R&D online community is positively associated with the extent that his/her roles of tuo'er are played.

On the other hand, the effectiveness of a tuo'er should be able to be identified through the attention he/she gets from the rest of the communities. When a tuo'er expresses an opinion, makes an appraisal or critique, raise a new idea to stimulate interactions, change the course of discussion, or influence decision making, it will be noticed by other community members. In other words, an "unnoticed" tuo'er is not effective. If a tuo'er is confident that his/her role has been effectively played, it is most likely that his/her actions in the intra-firm online R&D community are noticed and reacted on by other community members. Therefore, we expect that the more attentions a tuo'er received upon his/her actions in the intra-firm online R&D community, the more evident his/her roles of tuo'er are effectively played. We hypothesize:

H1b: The extent a tuo'er receives attentions from other members of an intra-firm R&D online community is positively associated with the extent that his/her roles of tuo'er are played.

Intrinsic and extrinsic motivations

Tuo'er by definition are responsible for the organization which "hires" them to manipulate the interactions in an intra-firm online R&D community in hope for enhancing knowledge sharing and innovations. Therefore, they have an obvious extrinsic motivation to play their roles in an online community. However, since tuo'er are also employees (in our particular case, R&D engineers), they might have other extrinsic and intrinsic motivations to participate in and contribute to the online communities. The extant literature in this respect is not sufficient to count for tuo'er, a special type of online community members (e.g., Shah 2006; Jeppesen and Frederiksen 2006).

Intrinsic motivation refers to doing something because it is inherently interesting or enjoyable and extrinsic motivation refers to doing something because it leads to a separable outcome (Ryan and Deci, 2000). On the one hand, when intrinsically motivated, a person will act for the fun or enjoyable challenge entailed rather than for external pressures or rewards. Therefore, it is likely that an employee may motivationally agree to act as a tuo'er in a R&D online community because he/she can, for instance, find a feeling of happiness, increase a sense of accomplishment, or become more creative. On the other hand, extrinsic motivation links an activity to some separable outcome with its instrumental value, which comes from either external pressure or external rewards. In the case of online R&D communities with a purpose of knowledge dissemination and sharing, a tuo'er may well have these extrinsic motivations such as *expected individual rewards* and *expected organizational associations* (Brock and Kim 2002). The former are expectations of personal outcome with regard to status, competence, promotion and salary raise, and the latter include enhanced associations with the organization and the communities. An employee is very likely to expect these external rewards when playing his/her roles of tuo'er.

As tuo'er might have both intrinsic and extrinsic motivations to play their roles in online R&D communities, it is reasonable to predict that when a tuo'er has high levels of intrinsic and extrinsic motivations, he/she will possibly contribute more original posts, answers more questions from others', uploading more documents than those who has low levels of motivations. Likewise, high levels of intrinsic and extrinsic motivations of a tuo'er may also be reflected in the roles they effectively play in online R&D communities. Thus, we predict that:

H2a: The extent a tuo'er is extrinsically and intrinsically motivated is positively associated with his/her contribution (in quantity) to the online R&D community.

H2b: The extent a tuo'er is extrinsically and intrinsically motivated is positively associated with the extent that his/her roles of tuo'er are played in the online R&D community.

About lead user traits

From the in-depth interviews with a number of tuo'er, we noticed that tuo'er are not only able to create a bandwagon heuristic, but also potentially an expert heuristic (Leibenstein 1950). By actively posting new information and sharing documents on the online R&D communities, a tuo'er with a recognizable ID might be conceived as an expert within a particular knowledge domain. Thus, a mix of motivations to contribute knowledge and learning to the online R&D communities and a potential expert status might make tuo'er *lead users* (Jeppesen and Frederiksen 2006). Lead users usually have three distinctive characteristics: (1) they usually find out about new ideas and solutions earlier than others; (2) they have benefited significantly by early adoption and use of new ideas and solutions suggested by other community members; (3) and when they notice new ideas and solutions suggested by other community members, they tend to put the new ideas or solutions into test (von Hippel 1986). These characteristics converge with tuo'er's expert identities, which may in turn reinforce the effectiveness of their roles. Therefore, we expect that in order for tuo'er to effectively play their roles in online R&D communities, they are most likely to exhibit characteristics of lead users. We hypothesize accordingly:

H3: A tuo'er who exhibits the characteristics of lead user is likely to extensively play his/her roles in an intra-firm online R&D community.

Sample and Methods

We take both inductive and deductive approaches with regard to research design (Jeppesen and Fredriksen 2006). It is inductive, as we use semi-structured interviews to explore the unclear roles of tuo'er and discover a number of issues that might be relevant for tuo'er's roles to be effective. The results of the inductive approach guide the development of hypotheses. It is also deductive because hypotheses informed by qualitative interviews are further developed based on theoretical expectations and empirically tested using online R&D community log data and survey data collected from all the tuo'er of the company.

As all data are collected from the same company, we are aware that there are clearly limitations to a case study (Yin 1993) based on the online R&D communities of one single firm. However, as the phenomenon of using tuo'er within intrafirm online communities is likely a common practice among firms and the roles and effectiveness of tuo'er are theoretically unnoticed and practically unclear, a case study of such a kind is extremely helpful to highlight the nature of tuo'er, their behaviors, and organizational implications. The case company is chosen for a number of specific reasons: first, it has been using tuo'er to facilitate the online R&D communities for a relatively long period, allowing longitudinal observations; second, we are able to get full access to the entire population of the tuo'er within the company and observe their online log data for a sufficiently long period; and third, the company is well representative for large corporations using intranet platforms to facilitate internal knowledge sharing and innovation among multiple areas of technological R&D.

Multiple data sources: To extend the strength of a single case study, we employ multiple data sources, as it is the preferred method when one seeks to understand or explain an underexplored phenomenon (Barley and Kunda 2001; Jeppesen and Fredriksen 2006). Thus, we collect data from multiple sources, including interviews, online questionnaire, and Web-logs of tuo'er's online activities.

First, a number of semi-structured interviews were conducted at the company with a purpose of exploring the roles of tuo'er and relevant issues that might affect the effectiveness of tuo'er (see previous section). Each interview took no less than two hours. Second, given the exploratory nature of the research, we also follow a "netnographic" approach as prior studies (Jeppesen and Fredriksen 2006). Netnography is an interpretive methodology,

focusing on the textual output of Internet-related fieldwork (Kozinets 1998). We observe the textual output of the company's online R&D communities with a special focus on what, when and how the tuo'er's acts in the communities during the period of March-July, 2014 (five months). It was made possible because the company revealed the identities of all tuo'er to the authors and granted us full access to the textual data of all online R&D communities during this period. This approach allows us to fully understand the context of a particular act of a tuo'er at a given situation without any potential misinterpretation. Third, the web-log data of all tuo'er in all online R&D forums of the company during the same period was used to measure the frequency of a tuo'er's actions in various forms. There are 23 tuo'er in total. When a tuo'er has more than one online ID, we aggregate all his/her online activities to one person. In this way, a balanced panel dataset is setup for the five-month period with 115 total observations. Last but not least, an online questionnaire was sent to all the 23 tuo'er with questions about their background information, motivations to make online contribution, their roles being played in the communities, and characteristics of lead users. The questions are mainly design with a 1-5 Likert scale (from "strongly disagree" to "strongly agree", see the appendix)². After the community manager sent two rounds of reminder, we reached a response rate of 100%.

Statistical models and variables: A detailed summary of all variables and items thereof with their alpha value are shown in Table 2 in accordance with the hypotheses. Hypotheses 1a and 1b predict the relationships between the extent of self-perceived role of tuo'er and a tuo'er's actual contributions and received attentions, respectively. Since we have a balanced panel data of 23 tuo'er with five consecutive monthly observations for each tuo'er during a five-month period and the value of self-perceived role of tuo'er is invariable overtime, a random effect model for panel data is employed, using GLS regression (*xtreg* command in STATA).

----- *Insert Table 2 here* -----

The dependent variable for H1a is the total number of contributions of a tuo'er in terms of original threads, reactive posts and document uploads. There are two dependent variables for H1b: one is the total number of views of a tuo'er's original threads, and the other is the total number of downloads of a tuo'er's uploaded documents. The independent variable for H1a and H1b is the roles of tuo'er, measured by three items (Cronbach's Alpha = 0.804). To check the validity of converging roles of tuo'er, we run a principle component factor analysis to determine the minimum number of factors that account for maximum variance in the data. The Kaiser-Meyer-Olkin measure is 0.663 and Bartlett's test of sphericity shows a large value of Chi-2 (123.063, $p < 0.01$), which indicated the appropriateness of a factor analysis. The result of the factor analysis indicated a single factor was sufficient to capture more than 72% of the variance in the roles of tuo'er. Thus, we used the factor score to measure this variable.

Hypothesis 2a predicts that relationships between a tuo'er extrinsic and intrinsic motivations and a tuo'er's actual contributions to the intrafirm online R&D communities; and Hypothesis 2b predicts that relationships between a tuo'er extrinsic and intrinsic motivations and the extent of self-perceived role of tuo'er. For H2a a random effect model for panel data is employed, using GLS regression (*xtreg* command in STATA) and for H2b an OLS regression model is used because the measures for dependent and independent variables are both obtained from the online questionnaire and are assumed invariable during the five months. The dependent variable for H2a is the same as the one for H1a and the dependent

² A potential bias embedded in the questionnaire is that value of motivations, roles of tuo'er, and characteristics of lead users rely on self-reporting, which is a common approach in organizational behavior research to measure concepts as such (Ryan and Deci 2000).

variable for H2b is the factor loading of the roles of tuo'er. The independent variables for H2a and H2b are the extrinsic and intrinsic motivations measured by a number of items. Following Bock and Kim (2002), we measure extrinsic motivations to share knowledge on online R&D communities in two aspects: one is *expected reward* (personal outcome expectation) and the other is *expected association* (relational outcome expectation towards the company and the online R&D communities). Expected reward is measured by four items (Cronbach's Alpha = 0.926). Expected association is measured by four items (Cronbach's Alpha = 0.940). Principle component factor analyses are run for both expected reward and expected association, which show satisfactory results for KMO and Bartlett's test. The factor scores for expected reward and expected association are used to measure these two aspects of extrinsic motivations, as one single factor accounts for 82.537% and 85.563%, respectively, of the variance in the variables. Intrinsic motivation is measured by three items (Cronbach's Alpha = 0.931). A principle component factor analyses is run for intrinsic motivation, which show satisfactory results for KMO and Bartlett's test. The factor scores for intrinsic motivation is used to measure this variable, as one single factor accounts for 88.671% of the variance.

Hypothesis 3 predicts the relationship between the characteristic of lead users and the extent of self-perceived role of tuo'er. An OLS regression model is used because the measures for dependent and independent variables are both obtained from the online questionnaire and are assumed invariable during the five months. The dependent variable is the lead user characteristics, measured by three distinctive items: (1) finding out about new ideas and solutions earlier than others, (2) significantly benefit by early adoption and use of new ideas and solutions suggested by other community members, and (3) putting the new ideas or solutions into test. The independent variable is the same as the one for H1a and H1b.

A number of control variables are included in the regression models as well. First, we use a binary variable to control for whether a tuo'er works at headquarter or a subsidiary company. Second, we control for how long a tuo'er has been working for the company, ranging from "less than one year", "one to three years", "three to five years", "more than five years", to "more than ten years".

Results

Panel data analysis of random effect models with GLS regression are used for hypotheses H1a, H1b, H2a, as the dependent variables in these models change over time during the five-month observation period and the independent variables are operationalized based on the information obtained from the online questionnaire. In this way, the potential self-reporting bias could be reduced. We first introduce a base model (Model 0), including only two main control variables: *headquarter affiliation* and *work experience*. We find that neither of them has a significant effect on the dependent variable, and the Wald Chi² is insignificant, indicating a poor model fit. After that, the main effect independent variables are introduced to Models 1- 5 in accordance with the hypotheses. The results are provided in Table 3.

----- Insert Table 3 here -----

First, in H1a and H1b we predict the relationships between the extent that a tuo'er plays his/her role is positively associated with a tuo'er's total number of online contributions and attentions received, respectively. To test H1a, in Model 1 we add the self-perceived roles of tuo'er as the main independent variable. The effect is insignificant ($\beta = 111.555$, $p > 0.10$) and the model fit is poor with an insignificant Wald Chi². Thus, H1a is not supported. To test H1b, we use two different measures for the dependent variable: one is measured by the total number of views of a tuo'er's original threads in Model 2, and the other is the total number downloads for a tuo'er's uploaded documents in Model 3. In Model 2, we control for the total

number of original threads and in Model 3 the total number of uploaded documents and knowledge notes are controlled for. In both Model 2 and Model 3, a large overall R^2 and a significant Wald χ^2 suggest good model fit. We find in Model 2 that the effect of tuo'er's role is insignificant ($\beta = 43.196, p > 0.10$) and the total number of views of a tuo'er's original threads has a positive effect on the dependent variable ($\beta = 124.989, p < 0.01$). To our surprise, we also find in Model 3 that the effect of tuo'er's role is significant and has a negative sign ($\beta = -140.413, p < 0.05$). Meanwhile, the total number of a tuo'er's uploaded documents has a positive and significant effect ($\beta = 11.407, p < 0.01$) and the total number of a tuo'er's uploaded knowledge notes has a negative and significant effect ($\beta = -1.368, p < 0.01$) on the dependent variable. Thus, H1b finds no support either.

Second, in H2a we expect a tuo'er's extrinsic and intrinsic motivations are positively associated with a tuo'er's contributions to the intrafirm online R&D communities. As one of the tuo'er did not complete the questions with regard to intrinsic and extrinsic motivations in the questionnaire, only 22 tuo'er are including in the sample, resulting 110 observations. To test H2a, we add *intrinsic motivations* and *extrinsic motivations* (including *expected reward* and *expected association*) into Model 4. The results show that the coefficient of intrinsic motivations is negative and marginally significant ($\beta = -33.434, p < 0.10$) and expected reward and expected associations do not show significant effects. When the role of tuo'er is introduced to Model 5 in addition to variables of intrinsic and extrinsic motivations, the results show no significant effects of any independent variables, further confirming that H1a and H2a are neither supported.

Next, OLS regression is used to test H2b and H3, as dependent and independent variables are all obtained from the online questionnaire with a cross-sectional design. The results are summarized in Table 4. With the roles of tuo'er as the dependent variable, we first made a base model with only two control variables: headquarter affiliation and work experience. After that, to test H2b, we add independent variables regarding intrinsic and extrinsic motivations into Model 1. The R^2 improved significantly compared to the base model. We find that intrinsic motivation has a positive effect, but not significant, on the dependent variable ($\beta = 0.254, p > 0.10$). Meanwhile, *expected reward* shows a positive and significant effect ($\beta = 0.567, p < 0.01$). However, *expected association* shows a negative effect, which is sufficiently significant ($\beta = -0.524, p < 0.05$). Thus we find only partial support for H2b. To test H3, we add three variables about distinctive lead user traits in Model 2, which yields improved model validity. We find that the first lead user traits (the propensity to find out new ideas and solutions earlier than others) and the third lead user traits (the tendency to put new ideas and solutions into test) have positive and significant effects on the dependent variable ($\beta = 0.434, p < 0.01$; $\beta = 0.326, p < 0.01$, respectively). On the contrary, the second lead user trait, namely, the propensity to significantly benefit from early adoption of new ideas and solutions, shows a negative and significant effect ($\beta = -0.709, p < 0.01$). Thus, H3 finds partial support and the nuances in the effects different lead user traits deserve further discussion.

Finally, even though the effects of the control variables are not the focus of this study, the findings regarding the effects of headquarter affiliation deserve some attention. In models 3, 4 and 5 in Table 3 (panel data analysis), we find that headquarter affiliation is negatively associated (significant at 0.01 level) with tuo'er's actual attention received in terms of the number of downloaded documents and total number of online contributions. However, in models 0, 1 and 2 in Table 4 (OLS regression), being affiliated with the headquarter becomes positively associated with the extent of tuo'er's roles to be played. These findings suggest that tuo'er affiliated to the headquarter perceive themselves as more influential than tuo'er at subsidiaries, but in fact they make less online contributions in terms of original threads and also receive less attention from other community members.

Discussion

As companies deploy tuo'er as hidden moderators in their online knowledge sharing communities, it is relevant and interesting to understand whether it works (or not), how it works and under which conditions it works. Based on the insights gained from a number of in-depth interview with relevant stakeholders, we develop a number of hypotheses with regard to the relationships between the extent tuo'er's roles are played and tuo'er's actual online contribution and received attention (H1a and H1b), the relationships between tuo'er's roles and their motivations (H2a and H2b) and lead user traits (H3). The results of hypothesis testing reveal interesting and surprising findings.

The results regarding H1a and H1b basically find no positive relationship between the extent a tuo'er plays his/her roles in the company's online R&D communities and his/her actual contribution and received attentions. We also find that when a tuo'er plays his/her role extensively, his/her uploaded knowledge documents are less frequently downloaded by other community members, even though it is the case that the more a community member posts, the more often it get noticed (viewed and downloaded). This seemingly odd finding could probably be interpreted in several ways: first, if a company wants to diffuse a message through unofficial channel via tuo'er, it could be effectively done as long as a tuo'er can post the message from time to time; second, the roles of tuo'er in terms of stimulating interactions, influencing discussion directions and decision making are more likely to be fulfilled through initiatives and feedbacks in quality rather than in quantity. In other words, the roles of tuo'er do not necessarily need to be done by posting *many* original themes of discussion and uploading *many* documents for sharing. This can also be understood by realizing that the roles of tuo'er are unnoticed when other community members usually do not directly pay attention to this small number of "special users", as tuo'er tend to keep a low profile within an online community.

In relation to the findings regarding H1a and H1b, we also find that there is no direct positive relationship between intrinsic and extrinsic motivations of tuo'er and their actual online contributions (H2a). In fact, some of them are not among the most active members in the online community in terms of actual number of posts, responses and document uploading. Again, this can be explained by the reasoning that it is the quality of an action matters, rather than the quantity. However, this finding shall not be misinterpreted because tuo'er's motivations are highly related to the extent to which they play their roles (H2b). We find that tuo'er are not intrinsically motivated and they are strongly motivated to play their roles in online R&D communities based on expected individual reward. Also, expected association with colleagues will prevent them from effectively playing their roles of tuo'er, perhaps because tuo'er will be concerned with their identities being revealed and being considered as "betrayal" if strengthened association with colleagues actually takes place. Therefore, expected association is not a motivational drive to play tuo'er's roles.

For H3 we find that tuo'er exhibit two main traits of lead users, as they are more keen than other employees on coming up with new ideas and solutions, which will be put into test. However, they do not feel significantly benefiting from early adoption of the new ideas and solutions. This finding needs to be understood in combination with the findings regarding tuo'er motivations: a tuo'er may actively seek and find out new ideas and solutions and test their usefulness and validity under prevailing extrinsic motivation (individual level of reward) without really needing to benefit from these new ideas and solutions because they are not intrinsically motivated. Therefore, it is interesting to find out that tuo'er motivational drives go hand-in-hand with their lead user traits.

The findings in this study have several managerial implications. First, for companies that are intended to use or have already been using tuo'er for intra-firm online knowledge sharing and innovation communities, it is important to understand that the effectiveness of

tuo'er does not rely on how many times they make direct contributions in the communities. Instead, it is important for the management and tuo'er to fully understand the roles of tuo'er and take appropriate actions in different circumstances. Merely asking tuo'er to post more threads, make more responses to others, and upload more documents will not do the job. Second, since tuo'er are primarily motivated by extrinsic motivations of expected individual reward and concerned about association with colleagues, companies shall effectively identify potential tuo'er who are relatively more self-driven and less dependent on strong collaboration with colleagues compared to other employees. Third, given their motivational drives, tuo'er can act like partial lead users. They shall be better used in combination with motivating other community members who are interested in benefiting from adopting tuo'er's new ideas and solutions. Only if tuo'er and regular online community members work together with mutually recognized purposes, a company may achieve effective knowledge sharing and learning, which eventually leads to innovations.

Limitations and future research

This study has a number of limitations. First, it is based on a single case study where in-depth information is collected through both qualitative and quantitative methods. Interviews, online log data and survey data are used in combination to gain deep insight into a yet unexplored phenomenon. Should we have access to several similar case companies and replicate the research approach, the validity and generalizability of the findings will be significantly improved. Future study will benefit from a multi-case study design that takes cross-organizational differences into account. Second, although tuo'er may be seen as a practice within a gray area of management ethics in one culture, other cultures may view it differently. This study is limited to the context in China. It will be interesting to see how companies exposed to other national cultures perceive the usefulness of tuo'er in online communities (Jackson 2011). Third, in this study we only looked into the use of tuo'er when they have already participated in the online R&D communities and resumed their "duties". We were not able to investigate the motivations and behaviors of tuo'er *before* they accept and *after* they fulfill their responsibilities. As participation and contribution to an online community is in a broad term special exchange relationships (Li-Ying and Salomo 2013), future research in this direction may benefit from using a metaphor of *deception* that can be deployed pre-exchange, during exchange, and after exchange (Aditya 2001). In this way, future research may differentiate the roles of tuo'er at different stages of involvement.

Conclusion

Although tuo'er are more and more often used in intrafirm knowledge sharing online platforms of large companies, the unique phenomenon of tuo'er is yet far from well understood. Based on several relevant streams of theories in the literature, we explore the theoretical foundations for the roles of tuo'er and investigate whether tuo'er make significant online contributions and receive most attentions. The findings suggest otherwise. Tuo'er are primarily extrinsically motivated with a strong focus on individual reward but not motivated by being associated with colleagues. These motivations are coupled with some traits of lead users, making it possible for them to contribute to online communities with qualitative inputs that can stimulate interactions and influence discussion directions and decision making. Companies that are interested in using tuo'er to enhance knowledge sharing and innovation within the organization should take notice accordingly to ensure the effectiveness of tuo'er without being considered performing unethical business practice.

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Appendix: Online questionnaire for official tou'er

Part I: Demographic

1. User name:
2. Gender: male/female
3. How long have you been working for "the company"?
4. How long have you been using the online communities?
5. How long have you been acting as tout in the online communities?

Part II: Self-evaluation of community activities for the online community in which you are most active (All questions are with the answer scheme of: very frequently, often, occasionally, very seldom, almost zero)

1. How often do you login the online communities per week?
2. How often do you post new threads on the online communities per week?
3. How often do you respond to other people's posted threads per week?
4. How often do you upload information materials on onto the online community per week? By "information materials", it means textual documents, pictures, diagrams, videos, and external URL links.

Part III: Motivations

Expected Rewards (Personal outcome expectation) (5-point Likert scale). Please evaluate the following statements based on your own belief:

If I make contributions to the online community, I will feel,

1. My co-workers will perceive me as competent.
2. I will increase my chances of obtaining a promotion.
3. I will be seen as higher in status by my peers.
4. I will increase my chances of getting a salary raise.

Expected Association (Relational outcome expectation) (5-point Likert scale). Please evaluate the following statements based on your own belief: *If I make contributions to the online community, I feel,*

5. it will help me to make friends with colleagues in my department.
6. it will strengthen the tie between colleagues from other department in our company and me.
7. it will be easy for me to get help from the colleagues in our company, with whom I have interaction on the online community.
8. it will be easy for me to get help from other colleagues in our company, with whom I have not direct interaction with on the online community.

Intrinsic motivations (5-point Likert scale)

Please evaluate the following statements based on your own belief:

If I make contributions to the online community, I will feel,

9. I will increase my feeling of happiness.
10. I will increase my sense of accomplishment.
11. I will become more creative.

Part IV: Lead user traits (5-point Likert scale)

1. In this community, I usually find out about new ideas and solutions earlier than others.
2. In this community, I have benefited significantly by early adoption and use of new ideas and solutions suggested by other community members.
3. When I notice new ideas and solutions suggested by other community members in this community, I have tried to put the new ideas or solutions into test.

Part V: Roles of tuo'er (5-point Likert scale)

1. I may stimulate the interactions on the online community.
2. I can somehow influence the direction of discussion.
3. I can somehow influence the decision making with regard to the development of a new proposal.
4. Without the role of tou'er, the community will not be as alive as it appears now.

Table 1: An overview of interviewees and their background

Functions	Number of persons interviewed	Remarks
Online R&D platform manager	1	This person oversees the entire online R&D platform. He has the mandate to enhance the company's overall effectiveness of knowledge sharing and management. He also has decision rights to implement new approaches on the online R&D platform and he has access to qualitative and quantitative online log data.
Official tuo'er	2	Two R&D employees who have the role of tuo'er as part of their work responsibilities. They have hands-on experience of "manipulating" the interactions in the online R&D communities.
Regular active user	1	An active user of the online R&D platform, thus a longtime member of the communities. He has insightful thoughts of how to use tuo'er to influence knowledge interactions on online communities in general, but he is not fully aware that the company actually is using tuo'er.

Table 2: A summary of variables, items, and reliability tests[illegible]

Table 3: Panel data analysis using random effect model for H1a, H1b, and H2a

Balanced panel data, Random effect GLS regression						
Coefficients and standard errors in brackets (Dependent are different across models)						
Models	<u>Model 0</u>	<u>Model 1: H1a</u>	<u>Model 2: H1b</u>	<u>Model 3: H1b</u>	<u>Model 4: H2a</u>	<u>Model 5</u>
Dependent variable	Total # of online contributions	Total # of online contributions	# of views of a tuo'er's original threads	# of downloads of a tuo'er's uploaded documents	Total # of online contributions	Total # of online contributions
Independent variables						
<i>Constant</i>	-114.377 (237.718)	-106.421 (231.899)	32.434 (183.135)	374.455 (205.552)	8.137 (43.930)	9.773 (45.498)
Headquarter affiliation	96.554 (155.460)	29.335 (158.786)	201.311 (125.521)	-381.838*** (140.161)	-60.380*** (21.911)	-58.939*** (22.990)
Work experience	61.146 (71.650)	67.941 (70.038)	-54.135 (56.324)	-2.484 (63.084)	19.220 (14.44)	18.449 (15.054)
Roles of tuo'er		111.555 (78.323)	43.196 (63.454)	-140.413** (71.429)		-3.998 (12.399)
A tuo'er's # of original threads			124.989*** (3.444)			
A tuo'er's # of uploaded documents				11.407*** (0.763)		
A tuo'er's # of uploaded knowledge notes				-1.368*** (0.284)		
Intrinsic motivations					-33.434* (19.40)	-32.416 (20.220)
Extrinsic motivations (Expected reward)					-16.417 (17.25)	-14.151 (19.096)
Extrinsic motivations (Expected association)					25.101 (25.899)	23.006 (27.437)
<i>Number of observations</i>	115	115	115	115	110	110
<i>R² overall</i>	0.036	0.091	0.938	0.703	0.272	0.274
<i>Wald chi²</i>	1.29	3.38	1440.83***	257.73***	18.07***	17.16***

- Significance levels: * p<0.10; ** p<0.05; *** p<0.01

- Standard errors in brackets.

Table 4: OLS regression analysis for H2b and H3

Models	<u>Model 0:</u> <u>Base model</u>	<u>Model 1:</u> <u>H2b</u>	<u>Model 2:</u> <u>H3</u>
Dependent variable	Roles of tuo'er	Roles of tuo'er	Roles of tuo'er
Independent variables			
<i>Constant</i>	-0.071 (0.279)	0.409 (0.357)	-0.227 (0.343)
Headquarter affiliation	0.602*** (0.183)	0.360** (0.178)	0.545*** (0.170)
Work experience	-0.061 (0.084)	-0.193 (0.118)	-0.042 (0.080)
Lead User Trait 1 (new ideas & solutions)			0.434*** (0.138)
Lead User Trait 2 (early adoption)			-0.709*** (0.141)
Lead User Trait 3 (putting into test)			0.326*** (0.100)
Intrinsic motivations		0.254 (0.158)	
Extrinsic motivations (Expected reward)		0.567*** (0.140)	
Extrinsic motivations (Expected association)		- 0.524** (0.211)	
<i>Number of observations</i>	23	22	22
<i>R²</i>	0.09	0.23	0.27

- Significance levels: * p<0.10; ** p<0.05; *** p<0.01

- Standard errors in brackets.